CLAIMS

1. An X-ray source, comprising:

an X-ray tube that emits X-rays in response to a current control signal;

an X-ray detector that detects X-rays emitted from said X-ray tube and provides a detected X-ray signal indicative thereof; and

a control system that receives said detected X-ray signal and provides said current control signal.

2. The source of claim 1, wherein said X-ray detector comprises a photodiode.

3. The source of claim 1, wherein said X-ray detector comprises a pin diode.

4. The source of claim 1, wherein said X-ray detector comprises an ionization detector.

5. The source of claim 1, wherein said X-ray detector comprises a scintillation detector.

6. The source of claim 1, wherein said X-ray detector comprises an electron multiplier.

7. The source of claim 1, wherein said X-ray detector comprises a charge-coupled device.

8. The source of claim 1, wherein said X-ray tube comprises an X-ray window through which the X-rays pass, and said X-ray detector is positioned directly adjacent to said X-ray window.

9. The source of claim 8, wherein said X-ray detector partially covers said X-ray window.

10. The source of claim 1, wherein said X-ray tube comprises an X-ray window through which the X-rays pass, wherein said X-ray detector comprises an X-ray transmissive device that completely covers said X-ray window to sense X-ray flux passing through said X-ray window.

11. The source of claim 1, wherein said X-ray detector comprises a segmented X-ray detector.

12. The source of claim 1, wherein said X-ray tube comprises an X-ray window through which the X-rays pass, wherein said X-ray window comprises an outside surface, and X-ray detector is located at a distance up to about 3 mm from said outside surface of said X-ray window.

13. The source of claim 12, wherein said X-ray detector comprises a photodiode mounted within a light tight package.

14. An X-ray tube control system that provides a current control signal to an X-ray tube, comprising:

an X-ray detector that detects X-rays emitted from the X-ray tube and provides a detected signal indicative thereof; and

a current control system that receives said detected signal and compares said detected signal against a reference value to generate the current control signal.

15. The control system of claim 14, wherein said X-ray detector comprises a photodiode.

16. The control system of claim 14, wherein said X-ray detector comprises a pin diode.

17. The control system of claim 14, wherein said X-ray detector comprises an electron multiplier.

18. The control system of claim 14, wherein said X-ray detector comprises a charge-coupled device.

19. The control system of claim 14, wherein said X-ray detector is positioned directly adjacent to said X-ray tube.

20. The control system of claim 14, wherein said X-ray detector partially covers an X-ray window of the X-ray tube.

21. The control system of claim 14, wherein said X-ray detector is an X-ray transmissive device that covers an X-ray window of the X-ray tube to sense X-ray flux from the X-ray window.

22. The control system of claim 14, wherein said X-ray detector comprises a segmented X-ray detector that is mounted adjacent to a cooperating segmented X-ray filter.

23. The control system of claim 21, wherein said X-ray detector comprises a photodiode mounted within a light tight package.

24. An X-ray source, comprising:

an X-ray tube that emits X-rays via an X-ray window in response to a current control signal, wherein said X-ray window includes an inside surface and an outside surface;

an X-ray detector that detects X-rays emitted from said X-ray window and provides a detected X-ray signal indicative thereof; and

a controller that receives said detected X-ray signal and provides said current control signal.

25. The X-ray source of claim 24, wherein said X-ray detector is located directly adjacent to said outer surface.

26. The X-ray source of claim 24, wherein said X-ray detector is located directly adjacent to said inner surface.

27. The X-ray source of claim 24, wherein said X-ray source is a battery powered device.

28. The X-ray source of claim 24, wherein said X-ray source is a handheld device.

29. The X-ray source of claim 24, wherein said X-ray device is configured for use as an X-ray fluorescence analytical instrument.

30. The X-ray source of claim 27, wherein said detector is configured and arranged as a segmented detector that includes a plurality of detector elements.

31. The X-ray source of claim 8, wherein said X-ray window is configured as an anode of said X-ray tube.

32. An X-ray source, comprising:

means for generating X-rays in response to a control signal;

an X-ray detector that senses said X-rays and provides a detected X-ray signal indicative thereof; and

a control system that receives said detected X-ray signal and a reference X-ray signal, and provides said control signal.

33. The X-ray source of claim 32, wherein said control signal comprises a current control signal.

34. The X-ray source of claim 32, wherein said reference signal is a time varying signal.